Colorectal Cancer Screening Among A Sample of Community Health Center Attendees

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Abstract: To determine the rate of colorectal cancer screening in patients attending a sample of community health centers, medical records of 1,176 patients from eight community health centers were abstracted. Among the patients studied, 43.8% of patients had undergone at least one of the three colorectal screening tests (fecal occult blood test, colonoscopy, or flexible sigmoidoscopy) in the recommended interval. Colorectal screening in this community health center population was predicted by male gender, being African American, older age, having a greater number of chronic illnesses, a family history of colorectal cancer, and by having engaged in other preventive cancer screenings in the previous year. Although screening rates certainly were not optimal, they compare favorably to rates reported in national surveys for the general population. Our results add to a growing body of evidence that community health centers, despite serving disadvantaged populations, are able to deliver preventive care at rates comparable to health facilities used by the general population.

Key words: colorectal neoplasms, vulnerable populations, cancer screening, community health centers.

Colorectal cancer (CRC) is the second leading cause of cancer death. In 2002, it is estimated that 147,300 people were diagnosed with colorectal cancer and

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56,600 deaths occurred due to the disease.[1] There are a number of effective screening tests for colorectal cancer including fecal occult blood testing (FOBT), flexible sigmoidoscopy, and colonoscopy.[2–6] As many as 90% of colorectal cancer deaths could be prevented with early detection and the removal of polyps.[7,8]

The burden of CRC is not borne evenly throughout the population, but instead is associated with several health disparities. African Americans, for example, are more likely to be diagnosed with late-stage disease and to have greater CRC mortality.[9–14] Likewise, patients of lower socioeconomic status and those lacking health insurance are also more likely to be diagnosed with late-stage disease and to have higher CRC-related mortality.[9,15] Poor cancer outcomes in these populations are thought to be the result of the lower rates of cancer screening.

Since they were first funded under Section 330 of the Public Health Services Act of 1975, numerous community health centers (CHC) have been established to provide primary medical care to disadvantaged populations. Today, there are more than 1,000 CHCs in the United States providing care for more than 11 million patients.[16] Because CHCs provide basic primary medical care, disadvantaged patients who attend CHCs are presumed to have access to appropriate cancer screening tests. Thus, CHCs are in a position to help eliminate health disparities that can be traced back to the availability of cancer screening tests. There may be barriers to cancer screening, however, that CHCs may not be able to overcome.

Results from a study based on a nationally representative sample of CHC attendees conducted were reported recently by Frick and Regan.[17] This study found high rates of five preventive services among attendees of CHCs. More than 80% of the women studied reported receiving a clinical breast examination in the previous year, 61% reported a mammogram in the previous 3 years, and more than 80% reported having received a Pap smear in the previous 3 years. In addition, there were no racial or socioeconomic screening differences within the sample studied, suggesting that CHCs were eliminating such disparities in care.

The frequency with which patients attending CHCs undergo recommended CRC cancer screening, however, is largely unknown. The study by Frick and Regan, for example, did not assess CRC screening rates. In addition, CRC screening data obtained from self-report may be of uncertain validity, especially among minority and underserved populations. For example, Hispanic patients' self-report of colorectal cancer screening events have been found to differ significantly from events documented by chart audit.[18] A study of CHC attendees similarly found that patients' self-report of CRC screening was often inaccurate when compared with results obtained by chart audit.[19] A valid assessment of CRC screening in CHCs, therefore, may require data obtained from chart audits.

Baseline results from an intervention to promote cancer screening provided us a rare opportunity to examine CRC screening rates for patients attending CHCs using the more accurate method of chart audit. We sought to determine whether patients attending CHCs were receiving CRC screening at the intervals recommended by medical organizations.[20,21] We also examined whether racial disparities in CRC screening existed in a setting of presumed equal access to care.

Readers unfamiliar with the CRC screening literature should note that in all studies, CRC screening is assessed only among patients eligible for screening (50 years and older).

Method

Population. The current study is part of a randomized intervention to increase cancer screening at community-based primary care clinics serving disadvantaged populations. We present an analysis of baseline data collected from participating clinics during 2002. Clinics were recruited from among the 16 CHCs participating in a county-funded health plan in Hillsborough County, Florida. The county health plan provides health care for uninsured individuals who do not qualify for Medicaid or Medicare and who have a chronic health condition.

Clinics were eligible if (1) they provided primary medical care 5 days a week, (2) the majority of the clinic staff agreed to participate, and (3) the clinic was expected to continue operating in the same fashion for the following 24 months. Eight clinics proved ineligible. One clinic refused to participate, one clinic was open only 1 day per week, and six clinics were uncertain if they would be operating in the same fashion over the 2-year period of the grant (because of such things as possibility of closing down, merging with another clinic, reducing days of service, and loss of key personnel).

Hillsborough County is a large (1,048 square miles) and diverse county located in west-central Florida, which includes the city of Tampa and its surrounding suburbs, along with large primarily rural areas to the east and south. Participating clinics were located either in Tampa neighborhoods that are home to disadvantaged populations ($n = 5$) or in surrounding rural areas of Hillsborough County in which migrant farm workers represented an important population served ($n = 3$).

Procedure. During data collection periods, research assistants assembled sampling frames of all patient visits using office billing and scheduling records. Medical records then were sampled randomly and abstracted to determine screening behaviors. A patient's records were eligible to be abstracted if both of the following criteria were met: (1) the patient was 50–75 years of age and (2) the patient was established in the clinic (defined as having made at least one visit 12 months or more before the sampled visit). Based on sample size requirements for the intervention, approximately 150 eligible charts were targeted for each clinic; the final total of audited charts was 1,176.

To prevent medical record reviews from influencing patient or provider screening behavior, and to allow adequate time for recommended screening tests to be completed, we abstracted charts three months after sampled patients had visited the clinic. Neither patients nor staff were aware of the time period during which chart abstractions would occur. In addition, randomization of clinics into intervention and control arms of the study did not take place until after baseline data were collected.

Data were abstracted from the current volume of each chart and utilized all sections of the chart including progress notes, laboratory reports, radiology reports, consultation letters, and hospital records. Sociodemographic information and information regarding various cancer screening measures and other preventive health measures were abstracted. The sociodemographic variables were date of birth, gender, marital status, race, insurance status, primary language, number of visits in the previous 12 months, number of chronic illnesses listed by physician on problem list, chronic illness information for the Charlson Comorbidity Index, number of

current medications, smoking status, whether the patient had a health maintenance visit in the previous 12 months, and personal and family history of breast, cervical, or colorectal cancer. For women, data were also collected on whether the patient had had a hysterectomy, a history of abnormal Pap smears, or a history of benign breast disease, or was taking estrogen replacement therapy.

For each of the cancer screening tests and preventive health measures, the date the procedure was completed was recorded. For annual screening tests, we defined being up-to-date as having completed the targeted screening test during either the 12 months before the audited visit or the 3 months following the audited visit. The use of a grace period has been applied in other studies[22–24] and allows sufficient time for screening tests that were recommended at an audited visit to have been completed by the patient. Screening data were collected for Pap smear, mammogram, FOBT, cholesterol screening, and prostate-specific antigen (PSA) testing. Chart reviews also assessed the use of flexible sigmoidoscopy within the previous 5 years, and colonoscopy/double-contrast barium enema within the previous 10 years.

Chart abstracters used a standardized method and instrument to abstract chart information; they were trained by the project manager. Prior to data collection, inter-rater reliability for chart abstracters was assessed for three cancer screening tests by re-reviewing a sample of 30 charts and calculating the kappa statistic. The following values of kappa were obtained when assessing whether a patient was up to date on cancer screening: Pap smear kappa = 1.00; mammogram kappa = 1.00; FOBT kappa = 0.91.

We measured patient comorbidity using the Charlson Comorbidity Index. The Charlson Comorbidity Index is not an exhaustive list of all possible comorbid conditions, but is rather a weighted index of 19 selected categories of disease that have been found to be associated with mortality and other important health outcomes.[25,26] Increasing values on the Charlson Comorbidity Index reflect a greater burden of comorbid disease.

The main outcome for our analysis was evidence of the patient having undergone any colorectal screening tests within the recommended interval from the time of their audited visit. Patients met this definition if they had undergone FOBT in the previous year, if they had had flexible sigmoidoscopy in the previous 5 years, or if they had undergone colonoscopy or double-contrast barium enema in the previous 10 years. We included in these definitions any screening that took place in the 3-month grace period between the audited visit and the time charts were abstracted.

We examined predictors of colorectal cancer screening using the *t*-test and chi-square test as indicated. We explored multivariate predictors of colorectal screening using multiple logistic regression. Logistic regression models examined the log odds of having obtained any one of the three colorectal screening tests within the recommended interval. All abstracted variables, including an indicator variable for primary care clinic attended, were eligible for inclusion in the final logistic regression model. The final logistic model consisted of those variables remaining statistically significant at the 0.05 level using a step-wise variable selection algorithm. For predictors of screening we report odds ratios and 95% confidence intervals. To determine the effects of gender-specific variables (such as estrogen replacement therapy or having had a PSA screening), we ran logistic models separately by gender.

Results

The study sample consisted of 1,196 men and women. The mean age of the sample was 59.4 years (standard deviation [SD] 5.9). The mean number of chronic illnesses recorded in the medical record was 6.4 (SD 3.0), and the mean number of medications recorded was 7.9 (SD 4.3). The average number of patient visits in the previous 12 months was 7.0 (SD 3.9). The study sample had an average score of 1.3 (SD 1.3) on the Charlson Comorbidity Index. Clinical characteristics of the study sample are summarized in Table 1.

Five hundred fourteen patients (43.7%) had undergone at least one of the three recommended CRC screening tests, either FOBT in the previous year, colonoscopy or double-contrast barium enema in the previous 10 years, or flexible sigmoidoscopy in the previous 5 years. Patients who had undergone CRC screening were older (mean age 59.8 years versus 59.1 years, t-test = -2.21, $p = 0.027$), had more chronic illnesses (mean number of illnesses 6.9 versus 6.0, t-test = -5.16, $p < 0.0001$), were prescribed more medications (mean number 8.3 versus 7.5, t-test = -3.32, $p = 0.0009$) and had more physician visits in the previous year (mean number 7.3 versus 6.7, t-test = -2.82, $p = 0.005$) than patients who did not undergo CRC screening. Screened and unscreened patients were similar, however, with respect to Charlson comorbidity scores (mean score 1.3 versus 1.4, respectively, t-test = 1.28, $p = 0.20$).

CRC screening was associated with other cancer screening tests. Among women, for example, CRC screening had occurred among 49.8% of women who had undergone screening mammography, while only among 34.1% of women who had not undergone screening mammography ($p < 0.0001$) had undergone CRC screening. Similarly, 54.8% of women who had had a Pap smear in the previous year were also found to have undergone CRC screening compared with 33.9% of women who had not had a Pap smear in the previous year ($p < 0.0001$). Colorectal cancer screening was also found more frequently among women taking estrogen replacement therapy (53.0% versus 41.2%, $p = 0.0007$).

Among men, CRC screening was undergone in 47.3% of men who had had PSA screening in the previous year and in 30.3% of men who had not had PSA screening ($p = 0.006$). For men and women together, CRC screening was found among 45.8% of persons who also had had their cholesterol checked in the previous year compared with 36.0% of persons who had not had their cholesterol checked ($p = 0.006$). Clinical predictors of CRC screening are summarized in Table 2. Patients who were African American were more likely to have undergone CRC screening than those who were white or Hispanic. Language was not a predictor of screening, either for the entire sample or among the subgroup of Hispanic patients. CRC screening was more common among patients having a positive family history of CRC and among patients who had had a preventive health visit in the previous year.

Results of the logistic regression model are summarized in Table 3. The odds of CRC screening in this CHC population increased with advancing age, were more than twice as great among men as among women, and were greater among patients who were African American or who had a positive family history of CRC. The odds of CRC screening increased with increasing number of clinic visits in the previous year, and with an increasing number of chronic health conditions recorded in the

Table 1.

CLINICAL CHARACTERISTICS OF STUDY SAMPLE ($N = 1,176$)

Clinical characteristics	*n*	%
Gender		
Male	251	21.3
Female	925	78.7
Race/ethnicity		
African American	341	29.0
White	569	48.4
Hispanic	266	22.6
Marital status		
Married	324	27.6
Unmarried	852	72.5
Primary language		
English	931	79.2
Non-English	245	20.8
Health insurance		
Hillsborough County	690	58.7
Medicaid	180	15.3
Medicare	228	19.4
Other	78	6.6
Smoking status		
Smoker	328	27.9
Nonsmoker	848	72.1
Charlson comorbidity score		
0	423	36.0
	275	23.4
2	266	22.6
≥3	212	18.0
Health maintenance visit in past year		
Yes	627	53.2
No	549	46.7
Previous history of cancer		
None	.,124	95.6
Breast	36	3.1
Cervix	16	1.4
Family history of cancer		
None	1,046	89.0
Breast	73	6.2
Cervix	20	1.7
Colorectal	37	3.2

(continued)

Table 1. Continued

Clinical characteristics	*n*	%
Colorectal screening tests[a]		
None	662	56.3
Flexible sigmoidoscopy	88	7.5
FOBT	337	28.7
Colonoscopy	182	15.5

[a]Flexible sigmoidoscopy assessed within the previous 5 years. FOBT defined as the testing of three specimens collected at home within the previous year. Colonoscopy assessed within the previous 10 years. Percentages exceed 100% because patients may have undergone more than one colorectal screening test.
Abbreviation: FOBT, fecal occult blood test.

medical record. The odds of CRC screening decreased, however, with higher Charlson Comorbidity scores. Finally, the odds of CRC screening were greater among patients who had undertaken other preventive health services, such as an annual health checkup or other cancer screening tests.

Discussion

Overall, we found that somewhat fewer than half (43.7%) of the persons studied had undergone any CRC screening test within the recommended interval. Of the three screening tests assessed, FOBT was the most commonly performed, although even this test was performed on only 29% of the sample. Predictors of CRC screening included male gender, African American race/ethnicity, older age, greater number of chronic illnesses, a positive family history of CRC, and having engaged in other preventive behaviors.

Several questions come to mind when examining these results. First, are the screening rates observed acceptable? Given the burden of CRC and the tremendous opportunity for reducing mortality and morbidity with screening, the screening rates observed are disappointing. Although the costs of providing tests such as sigmoidoscopy or colonoscopy may be prohibitive for clinics serving disadvantaged populations, FOBT is relatively inexpensive when compared with other more widely used tests (such as mammography). In absolute terms, our finding that less than one third of patients had undergone even FOBT screening is disappointing and represents a missed opportunity. Clearly, much more must be done to encourage screening for CRC, a largely preventable disease.

Second, are the screening rates observed comparable to other populations and settings of care? This question is more difficult to answer because of differing methodologies for measuring CRC screening. Most national estimates of screening have been based on the National Health Interview Survey (NHIS) and the Behavioral Risk Factor Surveillance Survey (BRFSS), both conducted by the Centers for Disease Control.

Table 2.

CLINICAL PREDICTORS OF COLORECTAL CANCER SCREENING ($N = 1,176$)

Characteristic	Patients screened for colorectal cancer[a] *n*	*%*	*p-Value*
Gender			0.09
Male	98/251	39.0	
Female	416/925	45.0	
Race			
White	228/569	40.1	
African American	175/341	51.3	
Hispanic	111/266	41.7	
Marital status			
Married	147/324	45.4	
Unmarried	367/852	43.1	
Primary language			0.31
English	414/931	44.5	
Non-English	100/245	40.8	
Smoking status			
Smoker	137/328	41.8	
Nonsmoker	377/848	44.5	
Health insurance			
County program	293/690	42.5	
Medicaid	86/180	47.8	
Medicare	104/228	45.6	
Other	31/78	39.7	
Family history of colorectal cancer			
Yes	24/37	64.9	
No	490/1,139	43.0	
Checkup in past year			<0.0001
Yes	326/627	52.0	
No	188/549	34.2	
Charlson comorbidity index score			
0	185/423	43.7	
	130/275	47.3	
2	113/266	42.5	
3+	86/212	40.6	

[a]Colonoscopy in previous 10 years, or flexible sigmoidoscopy in previous 5 years, or FOBT in previous year.

Table 3.

LOGISTIC REGRESSION OF COLORECTAL CANCER SCREENING PREDICTORS ($N = 1,168$)

Predictor	*OR*	*95% CI*	*p-Value*
Age[a]	1.03	1.01–1.05	0.02
Number of chronic illnesses[a]	1.12	1.07–1.18	<0.0001
Charlson comorbidity[a]	0.84	0.76–0.94	0.001
Gender			
Female	1.00		
Male	2.50	1.62–3.85	<0.0001
Race/ethnicity			
White	1.00		
African American	1.38	1.04–1.84	0.03
Hispanic	0.98	0.70–1.37	0.90
Family history of CRC	2.53	1.19–5.39	0.02
Checkup in previous year	2.44	1.85–3.21	<0.0001
Mammogram in previous year[b]	1.80	1.27–2.56	0.001
Pap smear in previous year[b]	2.46	1.80–3.27	<0.0001
PSA in previous year[b]	2.07	1.18–3.63	0.01
Visits in previous year[a]	1.05	1.02–1.09	0.004
Clinic #7	2.42	1.63–3.60	<0.0001
Clinic #11	4.11	2.70–6.23	<0.0001

[a]OR reflects the change in the odds of colorectal screening for each unit change in the predictor variable.
[b]ORs determined from logistic models run separately by gender.
Abbreviations: 95% CI, 95% confidence interval; OR, odds ratio.

The NHIS measures patient screening by self-report and inquires whether patients have had FOBT in the previous 2 years and whether they have undergone proctoscopy in the previous 3 years. The most recent results reported come from the 1998 NHIS in which 26.1% of women and 28.5% of men reported having FOBT in the previous 2 years, and 9.8% of women and 19.0% of men reported having proctoscopy in the previous 3 years.[27] The percentage of persons who answered affirmatively to either question was 30.2% for women and 37.1% for men. The screening tests assessed (proctoscopy) and the intervals of screening measured obviously limit the value of NHIS for comparisons. Despite these limitations, the screening results found in the sample of CHC studied are not strikingly different from those reported in the NHIS. The BRFSS also relies on self-report of screening behaviors, but inquires about screening tests and intervals of screening that are more commonly recommended. The most recently available (1999) BRFSS reported that 14.6% of respondents had undergone FOBT in the previous year and 25% had undergone either sigmoidoscopy or colonoscopy in the previous 5 years.[28]

Given that self-reports of screening generally overestimate screening rates obtained by chart audit,[18,19,29] the results observed in our sample of CHC would appear to be at least as good as these national estimates. The above results suggest that screening in our sample of CHC is at least on par with screening rates reported in the literature and derived from national studies. This is a noteworthy accomplishment given that CHC serve a disadvantaged population that is generally less likely to be screened.[27–31] The rates observed in this sample of CHC also appear to be on track to achieve the modest CRC screening goals put forth in *Healthy People 2010* (50% of persons having had FOBT in previous 2 years, and 50% of persons having ever had sigmoidoscopy).

Finally, is there evidence within this sample that CHC are achieving their goal of eliminating health disparities for minorities and persons of lower socioeconomic status? Similar to findings reported by Frick and Regan,[17] there was no evidence within our sample that racial or ethnic minorities were underscreened relative to white patients. On the contrary, we found that African Americans had significantly higher screening rates than did whites. We also found no evidence that type of health insurance (in this case also a marker for socioeconomic status) influenced the likelihood of having undergone CRC screening. As discussed, given that this sample of CHC serves a disadvantaged population yet achieved CRC screening rates that were similar to those reported in national surveys, it would appear they are achieving their stated goal.

Although the patient populations differ, the screening rates observed in our sample also compare favorably with those reported from similar chart review studies of CRC screening among other disadvantaged populations. For example, rates of FOBT in the previous year reported among attendees of CHC in New England were 9%[32] and among primary care practices in inner-city Chicago between 9% and 20%.[33] Rates of sigmoidoscopy in the previous 5 years were 2.5% among patients attending New England CHC.[32] The screening rates observed in our sample of CHC are very similar to rates observed in a chart audit of primary care practices participating in a Michigan research network (FOBT in previous year: women 28%, men 27%; sigmoidoscopy in previous 5 years: women 18%, men 22%).[34]

The predictors of CRC screening within our sample of CHC were in most cases similar to those reported in other studies. For example, patients with a family history of colorectal cancer,[35–37] men,[35,38–40] and those engaging in other preventive health services[34,37,41–43] were all groups more likely to be screened for CRC.

We found that African American patients in our sample, however, were more likely to have undergone CRC screening. In post hoc analysis, African American patients at the clinics we studied were similar to non-African Americans at those clinics with respect to age, gender, family history of CRC, comorbidity, number of chronic illnesses, and number of health care visits. African Americans were more likely to have had a checkup in the previous year, and were more likely to attend a high screening clinic (number 11). Even after controlling for these differences, however, African Americans still had 38% greater odds of having received CRC screening. In the most recent NHIS, CRC screening rates were lower for African Americans than for whites.[27] In a previous study of screening of patients attending CHC, however, racial differences in screening were not found.[17]

This study has several important limitations. First, our assessment of CRC screening was restricted to chart review; if CRC screening tests were not recorded in the patient's medical record they would not have been captured in our study. Furthermore, this study took place in CHC that had agreed to participate in a controlled trial. The participating clinics represent more than half of the health centers serving disadvantaged populations in Hillsborough County Florida. In addition, all data were collected at baseline before any intervention activities took place. Therefore, we believe the screening rates observed are representative of health centers in Hillsborough County Florida, although they may not be representative of other health care settings or other patient populations. We also did not have information on physician recommendations for screening, so we were unable to tell whether a patient's failure to undergo CRC screening was the result of a lack of physician recommendation or, instead, patient refusal of a recommended test. Conducting chart reviews three months after an audited visit may not have allowed sufficient time for all recommended screening tests to have been completed, causing us to underestimate the frequency of screening. Finally, we did not try to differentiate procedures carried out for diagnostic purposes from those carried out purely for screening purposes.

Overall, we found that 43.7% of patients attending the CHC studied had undergone some form of CRC screening within the recommended interval, with FOBT being the most commonly performed. Although screening rates were certainly not optimal, they compare favorably with rates reported in national surveys for the general population. Our results add to a growing body of evidence that CHC, despite serving disadvantaged populations, are able to deliver preventive care at rates comparable with rates for the general population.[44–47] Expanding patient access to CHC, therefore, is one promising approach to addressing disparities in cancer outcomes.

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